CLAIMS

1. A material comprising:

an aggregation of first particles and second particles within a binding matrix material;

wherein the first particles and the second particles are selected to have sufficiently different coefficients of thermal expansion so that thermal stresses generated there between during heating of the material result in a degree of micro cracking within the aggregation sufficient to achieve a desired degree of strain tolerance in the material.

2. The material of claim 1, wherein the difference in coefficients of thermal expansion between the first particles and the second particles is at least 3×10^{-6} /°K at 850°C.

3. The material of claim 1, wherein the difference in coefficients of thermal expansion between the first particles and the second particles is at least 4×10^{-6} /°K at 850°C.

4. The material of claim 1, wherein the difference in coefficients of thermal expansion between the first particles and the second particles is at least 5×10^{-6} /°K at 850°C.

5. The material of claim 1, wherein the binding matrix material has a coefficient of thermal expansion between that of the first particles and that of the second particles.

6. The material of claim 1, wherein the first particles comprise ceria and the second particles comprise mullite.

7. The material of claim 6, wherein the binding matrix material comprises alumina.

8. The material of claim 6, further comprising a volume ratio of ceria to mullite of about 1:2.

9. The material of claim 6, further comprising a volume ratio of ceria to mullite of at least 30%.

10. The material of claim 6, further comprising a volume ratio of ceria to mullite of up to about 50%.

11. The material of claim 6, wherein the aggregation further comprises third particles of alumina within the binding matrix material.

12. The material of claim 11, wherein the volume ratio of the third particles to that of the first and second particles is no more than 20%.

13. The material of claim 1, wherein at least one of the first particles and the second particles comprise hollow spheres.

14. The material of claim 6, wherein the ceria particles have a nominal size that is larger than a nominal size of the mullite particles.

15. The material of claim 6 having a ratio of ceria content to mullite content selected to provide a coefficient of thermal expansion of at least 5.6 X 10^{-6}/K at 850 °C.

16. The material of claim 6 having a ratio of ceria content to mullite content selected to provide a coefficient of thermal expansion of approximately 6.5 X 10^{-6}/°K at 850 °C.

17. The material of claim 1, wherein the micro-cracking preferentially occurs in one of the first and second particles.

18. The material of claim 1, wherein the first particles comprise one of the group of rare earth oxides, tetragonal zirconia, alumina, magnesia and spinel.

19. The material of claim 1, wherein the second particles comprise one of the group of mullite zircon, cordierite and celsian.

20. The material of claim 1, wherein the second particles comprise one of the group of silicon carbide and silicon nitride.

21. A composite material comprising:

a ceramic matrix composite material;

an aggregate material comprising first particles and second particles within a binding matrix material bonded to the ceramic matrix composite material;

wherein the first particles and the second particles are selected to have sufficiently different coefficients of thermal expansion so that thermal stresses generated there between during heating of the aggregate material result in a degree of micro cracking within the aggregate material sufficient to achieve a desired degree of strain tolerance in the aggregate material.

22. The composite material of claim 21, wherein the aggregate material exhibits a coefficient of thermal expansion at least 7% greater than a coefficient of thermal expansion of the ceramic matrix composite material at the same temperature.

23. The composite material of claim 21, further comprising a layer of ceramic thermal insulating material bonded to the ceramic matrix composite material opposed the aggregate material, the ceramic thermal insulating material having an outside surface defining an airfoil shape.

24. The composite material of claim 21, wherein the first particles comprise ceria and the second particles comprise mullite.

25. The material of claim 21, wherein the first particles comprise one of the group of rare earth oxides, tetragonal zirconia, alumina, magnesia and spinel.

26. The material of claim 21, wherein the second particles comprise one of the group of mullite zircon, cordierite and celsian.

27. The material of claim 21, wherein the second particles comprise one of the group of silicon carbide and silicon nitride.

28. A material comprising a sintered aggregation of ceria particles and mullite particles within a binding matrix material.

29. The material of claim 28, wherein the sintered aggregation further comprises alumina particles within the binding matrix material.

30. The material of claim 28, wherein the binding matrix material comprises alumina.

31. The material of claim 28, further comprising a volume ratio of ceria particles to mullite particles of about 1:2.

32. The material of claim 28, further comprising a volume ratio of ceria particles to mullite particles of at least 30%.

33. The material of claim 28, further comprising a volume ratio of ceria particles to mullite particles of up to about 50%.

34. The material of claim 28, wherein at least one of the ceria particles and the mullite particles comprise hollow spheres.

35. The material of claim 28, wherein the ceria particles have a nominal size that is larger than a nominal size of the mullite particles.

36. The material of claim 28 having a ratio of ceria content to mullite content selected to provide a coefficient of thermal expansion of at least 5.6 X 10^{-6}/K at 850 °C.

37. The material of claim 28 having a ratio of ceria content to mullite content selected to provide a coefficient of thermal expansion of approximately 6.5 X 10^{-6}/°K at 850 °C.